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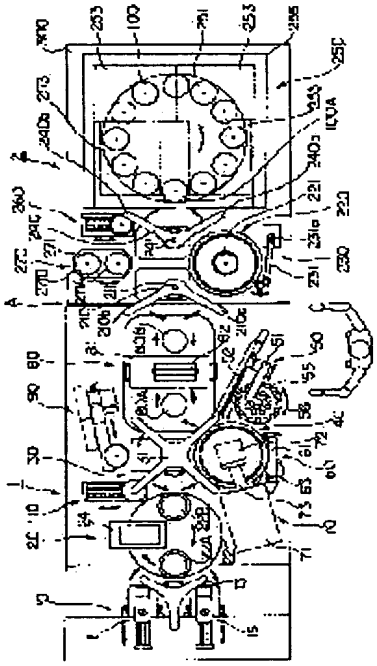
(54) METHOD AND APPARATUS FOR MANUFACTURING OPTICAL DISK

(57)Abstract:
PROBLEM TO BE SOLVED: To simplify the constitution of an apparatus which performs manufacturing of an optical disk including a process step of forming ≥2 continuous layers of radiation-curing resins on the disk.
SOLUTION: The apparatus for manufacturing has a first coating means for forming the first layer by coating the surface of the optical disk with a first liquid material of a radiation curing type, a second coating means for forming the second layer by coating the surface of the first layer on the optical disk with a second liquid material of a radiation curing type and a single radiation irradiation means for irradiating the disk with radiations having an effect of curing the first and second liquid materials of the radiation curing type after the coating of the first layer by the first coating means and after the coating of the second layer by the second coating means.



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CLAIMS

[Claim(s)]
[Claim 1] The 1st coating means which is the manufacturing installation of an optical disk, coats the liquefied ingredient of the 1st radiation hardening mold, and forms the 1st layer on an optical disk, The 2nd coating means which coats the liquefied ingredient of the 2nd radiation hardening mold, and forms the 2nd layer on the 1st layer on said disk, A single radiation irradiation means to irradiate the radiation which has in a disk the operation which stiffens said 1st and 2nd radiation-curing mold liquefied ingredients after coating of the 2nd layer after coating of the 1st layer by said 1st coating means, and by said 2nd coating means, The manufacturing installation of the optical disk characterized by ****(ing).
[Claim 2] Said radiation irradiation means is an optical disk manufacturing installation according to claim 1 characterized by changing exposure conditions in the time of the radiation irradiation to the disk after coating of said 1st layer, and the radiation irradiation to the disk after coating of said 2nd layer.
[Claim 3] Semi-hardening of the 1st layer of the 1st radiation-curing mold liquefied ingredient is carried out. after coating of said 1st radiation hardening mold liquefied ingredient according [said radiation irradiation means] to the 1st coating means -- a disk -- a radiation -- irradiating -- this -- After that, with the 2nd coating means, coat said 2nd radiation hardening mold liquefied ingredient, and the 2nd layer is formed. Then, said radiation irradiation means is an optical disk manufacturing installation according to claim 1 or 2 characterized by irradiating a radiation at a disk and stiffening said the 1st layer and 2nd layer completely.
[Claim 4] The optical disk manufacturing installation according to claim 1 to 3 which is after said 2nd-layer coating by said 2nd coating means, and is characterized by having further a heating means by said radiation irradiation means to heat a disk before the 2nd exposure.
[Claim 5] Said heating means is an optical disk manufacturing installation according to claim 4 characterized by having an infrared panel heater.
[Claim 6] The optical disk manufacturing installation according to claim 4 or 5 characterized by having a cooling table for carrying out predetermined time installation of the disk heated by said heating means, and cooling a disk naturally.
[Claim 7] The light transmission layer in which said 1st layer of said optical disk penetrates record and/or playback light, and the 2nd layer are an optical disk manufacturing installation according to claim 1 to 6 characterized by being a rebound ace court layer for protection of said light transmission layer.
[Claim 8] It is the manufacture approach of an optical disk including the process which carries out the laminating of the two-layer radiation hardening mold resin layer at least. A radiation with the operation which stiffens this resin layer after carrying out the laminating of the one resin layer is irradiated. The optical disk manufacture approach characterized by irradiating a radiation and carrying out full hardening of all the layers after this resin layer stops an exposure in the state of semi-hardening, repeats the process of carrying out the laminating of the following layer and carries out the laminating of the last layer.
[Claim 9] The optical disk manufacture approach according to claim 8 characterized by performing the laminating of said radiation-curing mold resin layer with a spin coat.
[Claim 10] The above-mentioned radiation is the optical disk manufacture approach according to claim 8 or 9 characterized by being ultraviolet rays.
[Claim 11] At least said two-layer radiation-curing mold resin layer of said optical disk is the optical disk manufacture approach according to claim 8 to 10 characterized by including the rebound ace court layer for the protection of a light transmission layer by which a laminating is carried out to the light transmission layer which penetrates record and/or playback light on it.
[Claim 12] It has the spinner device which holds a disk object and is rotated, and the dispenser device which supplies a liquefied ingredient near the center of said disk object held at said spinner device. This liquefied

ingredient is spread on a disk object according to a centrifugal force by supplying a liquefied ingredient near a disk object center, rotating a disk object according to said spinner device. It is spin coating equipment characterized by having the cleaner for cleaning the disk front face in which said dispenser device was prepared in one in the spin coating equipment which forms the paint film of said liquefied ingredient in a disk body surface.

[Claim 13] The coat spinner section which performs spin coating to a disk object, and the dryer part which heats the disk which had the paint film formed of a coat spinner, The cooling table section for cooling naturally the disk removed from the dryer part, The 1st disk transfer hand which transfers the disk put on the predetermined carrying-in location to said coat spinner section, and transfers the disk placed by coincidence on the cooling table section to a predetermined taking-out location, The 2nd disk transfer hand which transfers the disk put on said coat spinner section to said dryer part, and transfers the disk put on coincidence by said dryer part to said cooling table section, Are spin coating equipment which **** and said cooling table section has a migration device before and after moving the part which laid the disk to an one direction forward and backward. Spin coating equipment characterized by compensating the location gap with the location which places a disk on a cooling table by the location which takes up the disk on a cooling table by said 1st transfer hand by migration before and after this, and said 2nd transfer hand.

[Claim 14] It is spin coating equipment according to claim 13 characterized by the ability for said cooling table section to adjust the installation direction over an equipment base plate, and adjust the direction of said order migration by that cause with spin coating equipment according to claim 13.

[Claim 15] Take up the goods put on the 1st, 2nd, and 3rd processor and predetermined carrying-in location for processing continuously on goods, and it transfers to said 1st processor. The 1st goods transfer hand which the goods put on coincidence by the 3rd processor are taken up, and is transferred to a predetermined taking-out location, The 2nd goods transfer hand which the goods put on said 1st processor are taken up, it transfers to said 2nd processor, and the goods put on coincidence by the 2nd processor are taken up, and is transferred to the 3rd processor, It ****. Either of said 1st and 3rd processors The goods processing system characterized by having the migration device in which the part which laid said goods at least is moved to an one direction approximately, and compensating the location gap with the goods transfer hand of the above 1st, and the 2nd goods transfer hand by migration before and after this.

[Claim 16] Said one side of the 1st and 3rd processors is a goods processing system according to claim 15 characterized by the ability to adjust the installation direction and adjust the direction of said order migration by that cause.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention is concerned with the approach and equipment which carry out the paint film of the ingredient of a radiation hardening mold by coatings, such as spin coating, and manufacture an optical disk on a disk object. The approach and equipment of this invention fit creation of magneto-optic disks, such as optical disks, such as DVD system disks, such as CD system disks, such as CD, CD-R, and CD-RW, DVD-ROM, DVD-R, DVD-RW, and DVD-RAM, or a disk corresponding to the blue laser with which development is progressing in recent years, or MO, MD.
[0002]
[Description of the Prior Art] Spin coating is the technique of supplying a liquefied ingredient near the core of a disk object, rotating a disk object, spreading this liquefied ingredient with the centrifugal force by rotation, and forming the coat of this liquefied ingredient in a disk body surface by uniform thickness. Spin coating is widely used for formation of protective layers, such as for example, CD system disk and a DVD system disk, etc.
[0003] Development of the disk corresponding to blue laser is progressing as a next-generation information record medium on the other hand in recent years. although it has transparence substrates, such as a polycarbonate, and, as for a conventional compact disk and a conventional DVD disk, record the case of a record mold disk -- also reproduces information through a transparence substrate from that transparence substrate side, this disk corresponding to blue laser performs informational record playback from the opposite side with a substrate. Therefore, it is necessary to form a transparent light transmission layer with a thickness of 0.1mm (100 micrometers) on a recording layer (or reflecting layer).
[0004] In the application for patent No. 121377 [2001 to] to which it applied for the applicant for this patent previously Although it made it possible to form the light transmission layer of the disk corresponding to the blue laser of which the spin coating approach applicable suitable for formation of the light transmission layer of such a disk corresponding to blue laser is proposed, and precise control of thickness is required by this by radiation-curing die materials It is necessary to form the protection coat layer for a surface protection (rebound ace court layer) further on the light transmission layer by the disk corresponding to blue laser. It is suitable that this protection coat layer also coats radiation hardening die materials by spin coating etc., and forms them.
[0005]
[Problem(s) to be Solved by the Invention] Like the disk corresponding to the blue laser described as an example above, the protection coat layer is usually formed by coating radiation hardening die materials, such as ultraviolet curing mold resin, by the optical-recording-medium disk of a CD/DVD system. Like the topcoat layer in that case, for example, the light transmission layer in the above-mentioned disk corresponding to blue laser and a protection coat layer, and stratum functionale, such as a protection coat formed on it, carrying out the laminating of the two continuous layers by coating using both radiation hardening die materials in a record-medium disk may be called for. In such a case, since the laminating of the 1st layer is carried out and it was conventionally stiffened completely with one equipment, the laminating of the two-layer eye was carried out with another equipment. Therefore, two Ultraviolet curing units are required, and there was a problem that a crack occurred depending on the ingredient of a two-layer eye with the 1st layer, by forming the interface of a two-layer eye with the 1st layer.
[0006]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the manufacturing installation of the optical disk by this invention The 1st spin coating means which carries out

spin coating of the liquefied ingredient of the 1st radiation hardening mold, and forms the 1st layer on an optical disk, The 2nd spin coating means which carries out spin coating of the liquefied ingredient of the 2nd radiation hardening mold, and forms the 2nd layer on the 1st layer of the above on a disk, A single radiation irradiation means to irradiate the radiation which has in a disk the operation which stiffens the 1st and 2nd radiation-curing mold liquefied ingredients after coating of the 2nd layer after coating of the 1st layer by the 1st spin coating means, and by the 2nd spin coating means, It is characterized by ****(ing).
[0007] Thus, an equipment configuration can be simplified by facing coating a disk with a two-layer radiation hardening mold liquefied ingredient, and hardening a liquefied ingredient, using a single radiation irradiation means in common.
[0008] In this equipment, a radiation irradiation means can change exposure conditions, such as exposure radiation intensity, irradiation time, and an integral dose, suitably in the time of the radiation irradiation to the disk after coating of the 1st layer, and the radiation irradiation to the disk after coating of the 2nd layer.
[0009] Semi-hardening of the 1st layer of the 1st radiation-curing mold liquefied ingredient is carried out. moreover, after coating of the 1st radiation hardening mold liquefied ingredient according [on this equipment and / a radiation irradiation means] to the 1st spin coating means -- a disk -- a radiation -- irradiating -- this -- After that, with the 2nd spin coating means, the 2nd radiation hardening mold liquefied ingredient is coated, the 2nd layer is formed, and a radiation irradiation means can irradiate a radiation at a disk, and can also stiffen the 1st layer and 2nd layer completely. In this case, since the 1st layer is stiffened completely, the processing time can be shortened compared with the case where the 2nd layer is coated. Moreover, the following layer is coated with a semi-hardening condition, and generating of the crack between both the layers by the increase of the adhesive property of both layers, and expansion and contraction of an ingredient is reduced by stiffening both layers completely after that.
[0010] Moreover, in this equipment, it is after the 2nd-layer coating by the 2nd spin coating means, and a heating means by the radiation irradiation means to heat a disk before the 2nd exposure is established, and it may be made to perform annealing of a disk, and desiccation. Since heat will be directly absorbed by the disk if it is an infrared panel heater and the part of everything [standup / of temperature] but early and equipment is seldom heated, this heating means is suitable.
[0011] Moreover, the cooling table for carrying out predetermined time installation of the disk suitably heated by the heating means, and cooling a disk naturally is prepared.
[0012] This equipment can be used suitable for manufacture of the disk corresponding to blue laser, in that case, the 1st layer of the above is equivalent to that light transmission layer, and the 2nd layer is equivalent to a rebound ace court layer.
[0013] Moreover, the optical disk manufacture approach which this invention offers It is the manufacture approach of an optical disk including the process which carries out the laminating of the two-layer radiation hardening mold resin layer at least. After irradiating a radiation with the operation which stiffens this resin layer after carrying out the laminating of the one resin layer, and this resin layer's stopping an exposure in the state of semi-hardening, repeating the process of carrying out the laminating of the following layer and carrying out the laminating of the last layer, it is characterized by irradiating a radiation and carrying out full hardening of all the layers.
[0014] Thus, the processing time can be shortened by carrying out the laminating of the following layer in the state of semi-hardening, without stiffening each class completely. Moreover, generating of the crack by the interface formation between layers is reduced.
[0015] the approach of this invention -- manufacture of the disk corresponding to blue laser -- applying -- the above -- even if few, it can use suitable for the formation of a rebound ace court layer by which a laminating is carried out the light transmission layer as a two-layer radiation-curing mold resin layer, and on it.
[0016] In addition, although the liquefied ingredient of a radiation-curing mold is mentioned in the above-mentioned optical disk manufacturing installation and the above-mentioned optical disk manufacture approach by this invention, in this specification, a radiation-curing mold liquefied ingredient shall mean widely the liquefied ingredient hardened with light (the light, ultraviolet rays, and infrared radiation are included), an electromagnetic wave (wavelength is not asked), an X-ray, and the radiation as what also included that of oscillatory waves, such as a supersonic wave, in the electron ray pan. Of course, the radiation emitted in order to stiffen this liquefied ingredient also becomes a thing according to it.
[0017] Moreover, an optical disk contains magneto-optic disks, such as optical disks, such as DVD system disks, such as compact disks, such as CD, CD-R, and CD-RW, DVD-ROM, DVD-R, DVD-RW, and DVD-RAM, or a disk corresponding to the blue laser with which development is progressing in recent years, or

MO, MD, etc.
[0018] Another mode of this invention is concerned with a goods processing system applicable suitable for the above optical disk manufacturing installations again.
[0019] The 1st, 2nd, and 3rd processor for this goods processing system to process continuously on goods, The 1st goods transfer hand which the goods put on the predetermined carrying-in location are taken up, it transfers to the 1st processor, and the goods put on coincidence by the 3rd processor are taken up, and is transferred to a predetermined taking-out location, The 2nd goods transfer hand which the goods put on the 1st processor are taken up, it transfers to the 2nd processor, and the goods put on coincidence by the 2nd processor are taken up, and is transferred to the 3rd processor, It ****, either of the 1st and 3rd processors has the migration device in which the part which laid goods at least is moved to an one direction approximately, and it is characterized by compensating the location gap with the goods transfer hand of the above 1st, and the 2nd goods transfer hand by migration before and after this.
[0020] Although it is difficult to double the active position of two transfer hands correctly in the system using two transfer hands which transfer goods to coincidence from two places, respectively, by making the location of the goods on one processor movable like this invention approximately in an one direction, this location gap can be compensated and the goods by the transfer hand can be taken up correctly.
[0021] Since accommodation of one [said] installation direction of the 1st and 3rd processors can still be enabled in this system and the direction of the migration before and after the above can be made in agreement in the location gap direction between that accommodation of the direction of said order migration is possible, then two goods transfer hands by that cause, a location gap can be compensated more suitably.
[0022]
[Embodiment of the Invention] With reference to a drawing, the suitable operation gestalt of this invention is explained below. Drawing 1 is the top view of the coating equipment of the optical disk as an operation gestalt of this invention. This coating equipment is equipment used suitable for formation of the light transmission layer of the disk corresponding to the blue laser which is a next-generation disk, and a rebound ace court layer.
[0023] The diameter of 120mm in which the disk corresponding to blue laser only for playbacks formed the information pit, The reflective film of aluminum is formed in a polycarbonate substrate with a thickness of 1.1mm by the spatter. Carry out the spin coat of the optical (UV, i.e., ultraviolet rays) hardening mold resin as radiation-curing die materials to the front face, and a light transmission layer with a thickness of 100 micrometers is formed in it. Furthermore, it is created by carrying out the laminating of the acrylic resin layer of UV hardening mold by spin coating, and forming a rebound ace court layer (protection coat layer) with a thickness of 2 micrometers on it. The equipment of this example is equipment which performs spin coating of this light transmission layer and a protection coat layer.
[0024] Coating equipment consists of the spin coat section 1 located in left-hand side bordering on Rhine A of drawing 1 , and the rebound ace court section 2 located in right-hand side. The spin coat section 1 forms the light transmission layer of the disk corresponding to blue laser by spin coating, and the another side rebound ace court section forms a rebound ace court layer by spin coating further on the light transmission layer. In addition, although divided into the spin coat section 1 and the rebound ace court section 2 in the coating equipment of this example in the part displayed as A by drawing 1 , it is also possible to constitute these as continuous one-equipment.
[0025] The load unload section 10 for removing from equipment the disk which the spin coat section 1 supplied the disk which is equipped with many following parts, namely, should perform coating from the exterior, and coating processing finished outside, The cleaner section 20 for removing foreign matters, such as dust of the front face of the disk supplied from the load unload section, The transfer hand section 30 which performs the synchronized drive of a disk between each part in equipment, and the spinner section 40 which rotates a disk in order to perform the spin coat of a resin layer, The mask supply discharge section 50 which supplies the mask which covers the center section of the disk laid in the spinner section at the time of spin coating, and removes it again, The edge cleaning section 60 which removes the excessive resin ingredient protruded from the disk periphery section edge at the time of coating, The temporary hardening UV radiant section 70 which carries out temporary hardening of the front face of the resin layer applied to the disk on a spinner at the time of a spin coat by ultraviolet rays, it comes out with this hardening UV radiant section 80 which carries out actual hardening of the resin layer applied to the disk, the thickness Banking Inspection Department 90 which inspects the thickness of the resin layer formed in the disk, and the defective discharge section 110 in which formation of a resin layer discharges a faulty disk.
[0026] In accordance with the flow of processing, actuation of each part of the above of the spin coat section

1 is explained in order first. The loader section 11 of the load unload section 10 has the pin electrode holder 111 which holds two or more disks which should perform coating where a stack is carried out (put). Pin 111a of the pin electrode holder 111 is inserted, and a disk is held in the main hole. A spacer is inserted among the disks held at the pin electrode holder, and the disk of each other is made to estrange. In the bottom of the disk by which the stack was carried out, the lifter 112 which makes it go up and down a disk stack is formed. Level adjustment is carried out so that the disk of the top of a stack may serve as a predetermined supply height location by this lifter 112.

[0027] The load unload section is equipped with the supply hand 13 again. This supply 13 hand has three arms prolonged in a radial at equal intervals (namely, at intervals of 120 degrees). The disk pickup device adsorbed and released by vacuum adsorption which adsorbs a disk is prepared in the point bottom of an arm. The supply hand 13 is constituted so that it may rock under the predetermined control by the device control section (un-illustrating) at the circumference of 13d of the shaft. The disk of the top in the pin electrode holder 111 of a loader 11 is taken up by one arm 13a of the supply hand 3, and it transfers to supply / discharge location 22A on the turntable 22 of the cleaner section. At this time, a disk [finishing / processing] is transferable to up to the pin electrode holder 115 of the unloader section from location 22A on a turntable 22 with another arm 13b at coincidence. Another arm 13c is for transferring the spacer inserted between the disks by which the stack was carried out to the pin electrode holder 111 of the loader section on the pin electrode holder 115 of the unloader section.

[0028] The detail of actuation of the above supply hands is explained to Japanese Patent Application No. 11-289267 by the same applicant at the detail.

[0029] The disk transferred to the turntable 22 of the cleaner section 20 enters in a cleaner 24, appeared in a turntable by rotation of the clockwise rotation of a turntable. The cleaner 24 is equipped with the vacuum aspirator which absorbs particle, such as dust blown away by the wind of Blois and Blois which blows clean air upon a disk front face. It is good to carry out gear change control of the rotational speed of a turntable 22 suitably, to make rotational speed late, while the disk is moving in the inside of a cleaner 24, and to be made to perform disk cleaning over sufficient time amount. Moreover, in order to extend cleaning time amount further, rotation can be resumed, after ****ing rotation of a turntable 22 by the stop and making a disk once **** in the cleaner 24 between predetermined time, when the disk entered in the cleaner 24.

[0030] In addition, although the time amount to which I carry out gear change control of the turntable 22 which carries a disk, and a disk stays in a cleaner 24 is extended with this operation gestalt in order to clean a disk enough, you may make it rotate a turntable by fixed speed, as long as there is no need.

[0031] A disk passes a cleaner 24, and if a disk delivers on a turntable 22 and reaches location 22B (namely, location rotated 180 degrees from supply / discharge location 22A), a disk will be transferred to the spinner section by the transfer hand 31 of the transfer hand section 30.

[0032] Although the transfer hand 31 is structure similar to the supply hand 30 explained previously, the transfer hand 31 has four arms 31a, 31b, 31c, and 31d prolonged in a radial at equal intervals (namely, at intervals of 90 degrees) to the supply hand 30 having three arms. The disk pickup device adsorbed and released by vacuum adsorption which adsorbs a disk is prepared in the point bottom of an arm. The supply hand 13 is constituted so that it may rock under the predetermined control by the device control section at the circumference of the shaft 13a.

[0033] In addition, the transfer hand 31 moves the disk between each part of equipment to coincidence by the four arms 31a-31d. The condition by which it was shown in drawing 1 shows the position in readiness of the transfer hand 31. By rotating 45 degrees clockwise from this condition, Arms 31a, 13b, 31c, and 31d serve as a location which can take up the disk located in the cleaner section, the spinner section, this hardening UV radiant section, and the thickness Banking Inspection Department, respectively. Each arm takes up a disk by vacuum adsorption in the location, respectively. Then, the transfer hand 31 is rotated 90 degrees counterclockwise. The disk which the disk which suited this hardening UV radiant section of the disk which suited the spinner section of the disk which suited the cleaner section by this at the spinner section at this hardening UV radiant section had in the thickness Banking Inspection Department in the thickness Banking Inspection Department moves to the cleaner section at coincidence, respectively, and each arm releases a disk in each location. Thus, coincidence migration of the disk between each part by the transfer hand 31 is performed.

[0034] From the cleaner section 20, the disk transferred to the spinner section 40 is installed on the spinner table (un-illustrating) by which high-speed rotation is carried out, and vacuum adsorption is carried out. Spin coating of a light transmission layer is performed to a disk on this spinner table. Since the hole for the alignment in the case of wearing to disk drive equipment (15phi) is formed in the core of a disk with the

optical disk not only in the disk corresponding to blue laser, but generally as everyone knows and there is a slot for maintenance of La Stampa at the time of injection molding etc., a paint film is not formed in the core of a disk substrate. Therefore, even if it faces spin coating by this equipment, in order to prevent formation of the light transmission nature resin film in a disk core field, the pin center,large mask as a wrap mask member is attached for this field.

[0035] Supply and removal of the pin center,large mask 56 to the disk 100 on the spinner table in the spinner section 40 are performed by the mask supply discharge section 50. The mask supply discharge section 50 is disc-like, and contains the ball thread 52 which carries out both-way migration of the mask migration arm 51 which has the mask chuck which grasps two or more masks 56 (a total of 24 masks are shown by the example of drawing 1) which make the periphery array of a duplex and are placed on the pivotable mask storage 55 and mask storage at the circumference of the core, and a mask, and the mask migration arm 51 between the mask storage 55 and a spinner 40. The dispenser which supplies on a disk a coating ingredient (photo-curing mold resin which forms the light transmission film) is attached in the mask migration arm in one.

[0036] The mask on the mask storage 55 is taken up by the mask chuck of the mask migration arm 51, and a mask is attached on the disk installed in the spinner 40. Liquefied photo-curing mold resin is supplied on a mask from the dispenser formed in the point of the mask migration arm 51 after that, and the mask migration arm 51 is evacuated from a spinner 40 after that.

[0037] After the mask migration arm 51 evacuates, the spinner (****** in the middle of [its] front) table 152 is rotated at high speed, and spin coating actuation is performed, namely, it is made to make it distributed all over the top face of a disk according to the centrifugal force of rotation of the photo-curing mold resin supplied to the core.

[0038] If time amount predetermined [after the spin coating initiation by rotation of a spinner table] passes and the resin layer of almost uniform thickness is formed on a disk, edge cleaning which strips off the resin protruded into the periphery section of a disk with the edge cleaner 61 of the edge cleaning section 60 will be performed. The edge cleaner 61 is rockable in an equipment horizontal plane to the circumference of a shaft 63, and knife edge 65 attached by rocking at the end of the edge cleaner 61 approaches the periphery end face of a disk, and diminishes the photo-curing mold resin protruded from the disk periphery.

[0039] After such disk edge cleaning, temporary hardening of the photo-curing mold resin by the temporary hardening UV radiant section 70 is performed. The resin film in which film formation was equally carried out by spin coating to a disk side will lose the homogeneity of the thickness with the surface tension of liquefied resin, if spin is stopped, and it produces the heterogeneity to which especially the periphery section rose. Moreover, the heterogeneity of thickness becomes large, so that the viscosity of resin is high. In order to prevent this, after spin coating, without stopping rotation of a spinner, UV light is irradiated by the temporary hardening UV radiant section 70, and temporary hardening of a resin layer is performed.

[0040] The temporary hardening UV radiant section 70 contains the body section 71, the exposure head section 72, and the connection cylinder part 73 that connects the body section and the exposure head section. In the body section 71, the extra-high pressure mercury lamp (un-illustrating) as the UV light source is installed. An extra-high pressure mercury lamp emits the light (UV light is called below) of wavelength including the ultraviolet-rays (UV) field which can harden UV hardening mold resin. In the body section 71, condensing / sending-out optical system (un-illustrating) is installed further, UV light from an extra-high pressure mercury lamp is condensed, and it sends out as a UV light beam which goes to the connection cylinder part 73. The connection cylinder part 73 is a barrel in the air, and UV light beam passes through the inside of this connection cylinder part, and it carries out incidence to the exposure head section 72. The exposure head section 72 builds in the reflecting plate, bends UV light beam which carried out incidence from the connection cylinder part 73 90 degrees, and is irradiated towards a downward disk.

[0041] The outer diameter of the lighting field by the exposure head section 72 is made as [be / mostly in agreement with a disk outer diameter], and the bore is made as [be / mostly in agreement with a mask outer diameter]. Thereby, the exposure field of UV light beam is mostly in agreement with the entire disk outside the mask section. That is, UV light by the temporary hardening UV section is not irradiated by the mask placed on the disk. Since liquefied photo-curing mold resin is dropped on a mask at the time of spin coating, if UV light is irradiated at a mask, the resin of the boundary section of a mask and a mask, and a disk will be hardened, and removal of a mask will become difficult. In order to prevent this, it is made as [hit / the mask section / UV light].

[0042] What is necessary is just to reduce the fluidity of an ingredient to extent which the ununiformity of the thickness by the surface tension of a resin layer does not only generate, since the UV irradiation by this

temporary hardening UV radiant section is for preventing that the photo-curing mold resin layer by which coating was carried out on the disk generates the ununiformity of thickness with that surface tension. Exposure reinforcement for that and irradiation time are suitably decided according to the class and thickness of resin by which coating was carried out on a disk.
[0043] Rotation of a spinner is stopped after irradiating UV for temporary hardening. Then, vacuum adsorption of a mask 56 is canceled, a mask is taken up from a disk by the mask migration arm 51, and it transfers to the mask storage 55.
[0044] Furthermore, vacuum adsorption of the disk on a spinner table is canceled, a disk is taken up by arm 31b of the transfer hand section 30, and it moves to location 80A on this hardening UV radiant section 80.
[0045] This hardening UV radiant section 80 has the disk migration device 85 which carries out straight-line migration, rotating the UV irradiation unit 81 and disk 100 which irradiate UV light. A UV irradiation unit is equipment which has the UV lamp 82 and irradiates UV light caudad. Drawing 2 is the side elevation showing the outline of this hardening UV radiant section. While moving a disk to location 80B from location 80A according to the disk migration device 85, this hardening UV irradiation section 80 irradiates UV light, and advances further hardening of UV hardening mold resin on a disk to a disk.
[0046] Drawing 3 is drawing showing the important section of the disk migration device 85 of this hardening UV radiant section 80, and drawing 2 is a side elevation from a direction different 90 degrees. With reference to drawing 2 and drawing 3 , the configuration of this hardening UV radiant section is explained. The disk mobile unit contains the servo motor drive ball-thread unit 180 for carrying out straight-line migration of the spindle unit 182 and this spindle unit holding a disk. The housing 186 of the spindle unit 182 is being fixed to the driven nut of the ball-thread unit 180 through the plate 187 so that drawing 3 may show. In housing 186, the spindle 183 supported by non-illustrated bearing pivotable is installed. The spindle 183 is connected with the servo motor 184 through coupling 185, and a rotation drive is carried out with this servo motor 184. The crowning of a spindle 183 is made as [get / into the hole of the center of a disk 100], and the device for carrying out vacuum adsorption of the disk 100 further is also established.
[0047] Straight-line migration of the disk 100 installed on the spindle 183 of this hardening UV radiant section 80 according to the device explained above can be carried out by the ball-thread unit, rotating with a servo motor 184.
[0048] This hardening UV radiant section 80 is controlled on the occasion of hardening of a photo-curing mold resin layer by which coating was carried out on the disk to pass through the exposure field of a UV irradiation unit, rotating a disk 100. When the disk is rotating at the time of an exposure, even if heterogeneity is in exposure light distribution of a UV irradiation unit, the amount of UV irradiation which each part of a disk receives can be equalized.
[0049] The photo-curing mold resin which constitutes the light transmission layer hardened by extent to which a fluidity falls by the UV irradiation by the above-mentioned temporary hardening UV radiant section 70 is further hardened in this outward trip that goes to location 80B from location 80A of this hardening UV radiant section 80. However, at this time, a light transmission layer may not not necessarily be stiffened completely, and you may limit to a semi-hardening condition. Semi-hardening means the condition of having left the room of hardening by the further exposure here, although hardening of resin has arisen by the exposure of a radiation (this operation gestalt ultraviolet rays). Perfect hardening of the photo-curing mold resin which constitutes this light transmission layer is performed with hardening of a rebound ace court layer in the return trip of this hardening UV radiant section after the paint film of the rebound ace court layer mentioned later.
[0050] According to terms and conditions, such as extent of required hardening of photo-curing mold resin, and UV irradiation dosage required for it, it opts for straight-line migration control of the disk by the ball-thread unit in the above-mentioned outward trip suitably at this time. For example, the exposure field of a UV irradiation unit may be made to go with constant speed, or a stop or a rate is reduced in an exposure field, and you may make it extend irradiation time.
[0051] As explained above, a disk 100 receives UV irradiation from location 80A in the process moved to location 80B. Location 80B is a transfer location to the rebound ace court section 2. That is, in location 80B, a disk is transferred to the rebound ace court section 2 from the spin coat section 1.
[0052] Here explains the outline of the configuration of the rebound ace court section 2. The coat hand 210 which is the 1st transfer hand to which the rebound ace court section 2 delivers a disk between the spin coat section 1 and the rebound ace court section 2, The coat spinner section 220 as the 1st processor for carrying out spin coating of the rebound ace court layer on the light transmission layer in which coating was carried out by the spin coat section, The dispenser section 230 which serves as the cleaner which is the dispenser

section 230 which supplies UV hardening mold resin for rebound ace courts to the disk installed in the coat spinner section 220, and cleans a disk front face, The dryer part 250 as the 2nd processor which performs the desiccation of a disk and annealing by which coating was carried out in the rebound ace court layer with the desiccation hand 240 as 2nd transfer hand which moves the disk in desiccation table (after-mentioned) order, and the coat spinner, The disk stock section 260 which stocks the disk in order to prevent that a disk will be ****(ed) too much by the dryer part 250, when operation of equipment stops according to fault, In order to cool the disk removed from the dryer part 250, the cooling temporary placing table section 270 as the 3rd processor which carries out temporary placing of the disk temporarily is included.

[0053] Then, order is explained later on about actuation of each part of the rebound ace court section 2 stated above.

[0054] The disk in location 80B of this hardening UV radiant section 80 of the spin coat section 1 is taken up by the coat hand 210, and is installed on the spinner table 221 of the coat spinner section 220. A drive is possible for the coat hand 210 to the circumference of the shaft 211, and one arm 210a is located on the disk of location 80B by carrying out a drive to a clockwise rotation 45 degrees from the condition shown in drawing 1 . The disk which is in location 80B according to the vacuum adsorption device (un-illustrating) prepared in the point of arm 210a in this location is taken up. The drive of the coat hand 210 is carried out 90 degrees counterclockwise after that, a disk is carried on the coat spinner 220, vacuum adsorption of a disk is released in the location, and a disk is installed on the spinner table 221. In addition, when moving a disk to the coat spinner 220 from location 80B of this hardening UV radiant section by arm 210a, arm 210b of another side of the coat hand 210 moves the disk on the cooling temporary placing table section 270 to coincidence at location 80B.

[0055] Although spin coating of the rebound ace court layer is carried out on a disk on a coat spinner, in advance of spin coating, the disk front face by the dispenser section is cleaned. The side elevation of the dispenser section is shown in drawing 4 . The dispenser section has the disk Spencer arm 231 in which a drive is possible in the circumference of shaft 231a (drawing 1 R> 1). The rebound ace court liquid spreading nozzle 233 and the electric discharge cleaner nozzle 235 are attached in this dispenser arm 231. The electric discharge cleaner nozzle is connected with the electric discharger 237 which generates ion, and it cleans by blowing away the dust on the front face of a disk by spraying the air containing ion on a disk front face, discharging electricity. It is made to go and come back to a disk top in the direction of a path several times by making the dispenser arm 231 rock to the circumference of shaft 231a, rotating a disk 100 on the spinner table 221, in case it cleans.

[0056] After cleaning of a disk 100 is completed, the liquefied UV hardening mold resin for rebound ace court layers is dropped at a disk by the rebound ace court liquid spreading nozzle 233 of a dispenser, high-speed rotation of the disk is carried out, and spin coating of a rebound ace court layer is performed. In addition, although UV hardening mold resin is used as a rebound ace court layer with this operation gestalt, as long as a rebound ace court layer is an ingredient hardened with the energy line used not only in this but in the spin coat section, they may be other things. For example, the energy-line hardening mold resin of others, such as EB hardening mold resin, may be used. There may more specifically be acrylic resin, epoxy system resin, urethane resin, etc.

[0057] The disk 100 after termination of spin coating and in the coat spinner 220 is transported to a dryer part 250. The side elevation of a dryer part 250 is shown in drawing 5 . A dryer part 250 is equipped with the heater unit 254 which has the circular desiccation table 251 and the infrared flat panel heater 253 (a two-dot chain line shows at drawing 1) of four sheets installed in the upper part. The desiccation table 250 is constituted so that the disk 100 of 12 sheets can be laid near [the] a periphery at intervals of 30 degrees (drawing 1). The desiccation table 251 is rotatable to the circumference of the core, and an index drive is carried out so that it may rotate by a unit of 30 degrees. The motor 256 for an index drive, the index device (cam unit) 257, and 1 cycle detection sensor 258 that detects rotation 30 degrees are formed in the lower part of the desiccation table 251. The desiccation table 251 and the heater unit are installed in the drying furnace 255.

[0058] The disk 100 taken up from the coat spinner 220 is taken up by arm 240b of another side of a desiccation hand, and is sent to degree process in the place which returned to the location which was established in the location on the desiccation table 251 displayed as 100A by arm 240a of the desiccation hand 240 in drawing 1 , made one revolution along with rotation of the desiccation table 251 after that, and was again displayed as 100A. A disk 100 is heated by the heater unit installed up while the desiccation table 251 rotates one time. Desiccation operation which evaporates the solvent of the rebound ace court liquid applied on the disk by this heating, and annealing which eases distortion of a resin layer are performed. The

curvature of a disk is reduced by annealing.
[0059] Here, the infrared panel heater 253 is used for the heater unit 254. Since neither adhesion of the dust by the air current nor the problem of the bias of the thickness distribution by the wind pressure arises like the desiccation system of a warm air ventilation type again, this is suitable. Moreover, since not ambient atmosphere heating but heat is absorbed directly, the standup of a temperature rise also has the advantage that the temperature of parts other than early and a disk (desiccation table etc.) seldom rises. In addition, the time amount (namely, time amount which the desiccation table 251 rotates one time) which controls the temperature of the disk in desiccation circles to become about 80 - 90 degrees, and has each disk in desiccation circles is about 3 - 10 minutes. These drying temperature and drying times are suitably decided according to an ingredient, thickness, etc. of the light transmission layer formed in the quality of the material and the disk of a disk substrate, and a rebound ace court layer.
[0060] The method of installation of the disk to a rotary table top to drawing 6 is shown. The disk 100 is carried on the guide pin 252 attached in the rotary table, and the rotary table 251 and the disk 100 have not touched directly. By use of the infrared panel heater 253 explained to such a configuration and a top, a disk is heated to about 90 degrees C, and the temperature of a rotary table (here product made from stainless steel) is about 40 degrees C to it.
[0061] As stated previously, disk 100A which took 1 round on the desiccation table 251 of a dryer part 250, and returned to the disk ejection location is taken up by arm 240b of the desiccation hand 240, and is taken out from the inside of a drying furnace 255. The movement toward the desiccation hand 240 in that case is the same as that of actuation of the coat hand 210. That is, the drive of the desiccation hand 240 is clockwise carried out 45 degrees a core [a shaft 241] from the condition first shown in drawing 1 , arm 240a takes up the disk on the spinner table of a coat spinner there, and arm 240b takes up disk 100A on a desiccation table to coincidence. And when the desiccation hand 240 rotates 90 degrees counterclockwise, the disk of a coat spinner is transported to a desiccation table, and the disk of a desiccation table is transported to the cooling temporary placing table section, respectively.
[0062] When it is the alarm condition which fault produces by some part in the whole coating equipment in that case, and actuation of equipment stops, arm 240b of a desiccation hand releases a disk in the heating disk stock section 260 currently installed in the middle of a dryer part 250 and the cooling temporary placing table section, and a disk is stocked in the heating disk stock section 260. When operation of coating equipment stops according to a trouble, if the ejection of the disk from a dryer part is also suspended, the disk of desiccation circles will be exposed to long duration heat across the proper range, and will produce defects, such as camber of a disk substrate. The heating disk stock section 260 is formed in order to prevent this, and with the equipment of this operation gestalt, even when other parts of equipment stop, it can remove the disk of desiccation circles after predetermined heating time, respectively.
[0063] The cooling temporary placing table section 270 is formed in order to cool the disk heated by 80-90 degrees C by the dryer part 250 to some extent. As an example, it cools to about 50 degrees C. In case this performs UV irradiation on a disk after this for rebound ace court layer hardening, it is for preventing that disk temperature goes up further and deformation arises in a disk substrate. The cooling temporary placing table section 270 has the cooling table 271 which can lay the disk of two sheets. Drawing 7 and drawing 8 are the top views and side elevations showing the cooling temporary placing table section. The cooling table 271 can lay the disk 100 of two sheets, as it is the table in which it can be circled and is shown in drawing 7 180 degrees with a rotary actuator 273 (drawing 8). The disk transported from the dryer part 250 by the desiccation hand 240 is first put on location 271A on a cooling table (drawing 1). After that, the cooling table 271 circles 180 degrees and moves a disk to location 271B. Then, the following disk is put on location 271A, and if a cooling table circles 180 degrees again, the first disk will return to location 271A. This disk is taken up by arm 210b of the coat hand 210, and is sent to degree process here. the above explanation shows -- will come out and I will be -- a disk is cooled like between the periods for two steps of equipment operation on a cooling table, and on the cooling table 271. In addition, although cooling in this operation gestalt is natural air cooling, forced cooling of various gestalten may be used.
[0064] The cooling temporary placing table section 270 equips the one direction within an equipment horizontal plane with the order cylinder 274 (drawing 8) for carrying out order migration (namely, reciprocating motion) again, in order to amend the location gap between two migration hands 210, i.e., a coat hand, and the desiccation hand 240 (absorption). The cooling temporary placing table section 270 has the device for adjusting the direction of order [this] migration further. That is, it is fixed on the fixed plate 275 and adjustment of a location is attained for the cooling table, the rotary actuator, and the order cylinder 274 whenever [to the base plate of the equipment of this fixed plate 275 / setting-angle]. This is explained

with reference to drawing 9 below.
[0065] Drawing 9 is the fixed plate 275 of the cooling temporary placing table section 270, and the plan of the order cylinder 274. Long hole 275a of the shape of radii of a pair is prepared in the fixed plate 275. The fixed plate 275 is fixed to the base plate (rebound ace court section 2) 300 of equipment with the securing bolt 276 inserted in this long hole 275a. The fixed plate 275 can adjust whenever [to the base plate 300 of the fixed plate 275 / setting-angle] in a certain range by fixing to a base plate 300 with the bolt in a long hole. The screw-thread hole 277 for furthermore fixing a securing bolt 276 to the base plate 300 of equipment is formed at intervals of [eight] 45 degrees. Drawing 9 shows the condition that the securing bolt 276 is being fixed to two of eight screw-thread holes. Since the securing bolt 276 of a pair is fixable to two screw-thread holes of arbitration with which it counters of the eight screw-thread holes 277, the fixed plate 275 is fixable to the angular position of arbitration with existence of the above-mentioned long hole 360 degrees to a base plate 300 conjointly.
[0066] The cooling temporary placing table section can amend the location gap between the coat hand 210 and the desiccation hand 240 according to such a device. This is explained below.
[0067] As already explained, delivery of the disk to the cooling table 271 is performed by arm 240b of the desiccation hand 240, and ejection of the disk from the cooling table 271 is performed by arm 210b of the coat hand 210. However, the location of the coat hand 210 is adjusted according to location 80A in this hardening UV radiant section 80, and the spinner table 221 of the coat spinner section 220, and the location of the desiccation hand 240 is adjusted according to location 100A of a spinner table and a dryer part 250 on the other hand. Therefore, a location gap will arise between the disk delivery location to the cooling table 271 by the desiccation hand 240, and the disk ejection location from the cooling table 271. A location gap is cancelable by doubling the migration direction (the direction of an arrow head of drawing 9) of the order cylinder 274 in the above-mentioned location gap direction there, and changing the location of a cooling table in the order cylinder 274 further in the time of the disk reception from the desiccation hand 240, and disk delivery in the coat hand 210.
[0068] The disk taken up by coat hand 210b from the cooling temporary placing table section 270 is transferred to location 80B on this hardening UV radiant section by the side of the spin coat section 1. In this location, a disk is laid on the spindle 183 of the disk migration device 85 of this hardening UV radiant section 80.
[0069] It is moved by the disk migration device 85 toward location 80A from location 80B, rotating with a spindle 183, and the disk placed on the spindle 183 receives the UV irradiation by the UV irradiation unit by the middle. Under the present circumstances, according to terms and conditions, such as UV irradiation time amount required for hardening of resin, it opts for straight-line migration control of the disk by the ball-thread unit 180 suitably. For example, the exposure field of a UV irradiation unit may be moved with constant speed, or a stop or a rate is reduced in an exposure field, and you may make it extend irradiation time.
[0070] In the return trip of this hardening UV irradiation section 80 of this, this hardening processing which hardens completely the photo-curing mold resin which forms the rebound ace court layer formed the light transmission layer (this is in a semi-hardening condition by the UV irradiation in an outward trip) by which the paint film was carried out on the disk, and on it, respectively is performed.
[0071] The disk 100 which finished this hardening processing and was returned to location 80A is transferred to the next thickness Banking Inspection Department 90 by arm 31C of the transfer hand section 30. The thickness Banking Inspection Department measures the thickness of the light transmission resin layer of a disk, in order that the thickness of the light transmission resin layer by which coating was carried out to the disk may inspect whether it is within the limits of predetermined. A disk 100 is laid in a trolley table 91 by arm 31C of a transfer hand in location 90A of the thickness Banking Inspection Department. It is moved by the 1 shaft ball-thread unit 93 along with this unit 93, and a trolley table 91 is moved directly under the laser displacement gage 95 as a thickness measurement machine. The trolley table 91 has the function to rotate the disk laid on it, combining rotation of a disk and the straight-line migration by the ball-thread unit 93, changes the point of measurement by the laser displacement gage, and performs thickness measurement in two or more point of measurement to one disk. In a typical example, measurement of eight points each is performed [top / one periphery] about the seven direction locations of a path. Therefore, point of measurement turns into 8x7=56 point.
[0072] The disk which finished thickness measurement is again returned to location 90A, appeared in a trolley table, and is sent to the cleaner section 20 by arm 31D of the transfer hand section 30 in the location. However, as a result of the thickness inspection in the thickness Banking Inspection Department 90, the bad

disk it was proved that it is that coating is not performed by proper thickness cancels the vacuum adsorption by arm 31d in the middle of the transfer in the cleaner section from the thickness Banking Inspection Department 90, and delivers a disk to the bad-disk discharge section 110.
[0073] It is moved to location 22A by rotation of a turntable 22, and the excellent article disk transferred to location 22B of the cleaner section 20 from the thickness Banking Inspection Department 90 is laid so that pin 115a may fit in on the pin electrode holder 115 of an unloader 15 by supply hand 13b in the main hole of a disk and it may be crowded from there. In addition, the pin electrode holder 115 by the side of an unloader 15 as well as the pin electrode holder by the side of a loader 11 is equipped with the lifter 116, this lifter 116 descends as the stack of the disk is carried out to the pin electrode holder 115 and it goes, and it is made for the height of the disk of the top of a stack to become always fixed. If the stack of the processed disk of a predetermined number is carried out to the pin electrode holder 115 of an unloader 15, the pin electrode holder 115 will be moved leftward [of drawing 1], and it will enable it to take out the disk by which the stack was carried out from the equipment left end equipment picking.
[0074] One cycle of actuation of the spin coating equipment of this operation gestalt is completed above.
[0075] In addition, all actuation of the spin coating equipment explained above is automatically performed under control of the control section (un-illustrating) of equipment which has CPU. Although 1 operation gestalt of this invention was explained above, this invention is not limited to this operation gestalt.
[0076] Although the above operation gestalt was related with the light transmission film of the disk corresponding to blue laser, and spin coating of a rebound ace court layer, in case not only this but this invention coats the radiation hardening die-materials layer more than two-layer on a disk object, it can be applied widely. As other examples, coating of the topcoat layer of CD-R and the rebound ace court layer formed on it etc. occurs.
[0077] Moreover, although the resin by which coating was carried out in this operation gestalt was UV hardening mold resin, this invention is not limited to this, for example, can be applied to coating to the disk object of radiation hardening die materials with various photo-curing die materials of infrared hardening die materials and others, electromagnetic wave hardening die materials, X-ray hardening die materials, electron ray hardening die materials, or ultrasonic hardening die materials etc.
[0078]
[Example] Using the equipment explained to the above-mentioned operation gestalt, as it was the following, the disk corresponding to blue laser was created.
[0079] By the spinner section 40, ultraviolet curing mold resin (viscosity 5000cP in 25 degrees C) was applied to the disk which formed the reflective film which consists of aluminum on a disk-like base with the spin coat, semi-hardening of the UV addition quantity of light of 140 mJ/cm2 was irradiated and carried out to it in the outward trip of this hardening UV radiant section 80, and the light transmission layer of 98um was obtained. Then, by the coat spinner section 220, the spin coat of the acrylic rebound ace court (Nippon Kayaku HOD3200) was carried out by the thickness of 2um(s) on the light transmission layer. The heating conditions in a dryer part 250 were annealed as for [80 degrees-C] 5 minutes, and the light transmission layer and the rebound ace court layer were stiffened by UV addition quantity of light 3000 mJ/cm2 in the return trip of this hardening UV radiant section 80 after cooling.
[0080] The optical disk created as mentioned above does not have generating of a crack in various reliability trials, and the camber angle of a disk reduced it in the abbreviation one half of a disk without annealing by hardening of annealing.
[0081]
[Effect of the Invention] An equipment configuration can be simplified by facing coating a disk with a two-layer radiation hardening mold liquefied ingredient in the optical disk manufacturing installation of this invention, and hardening a liquefied ingredient, using a single radiation irradiation means in common.
[0082] Moreover, in the disk manufacturing installation of this invention, after the 1st coating, irradiate a radiation and semi-hardening of the radiation-curing mold resin ingredient of the 1st layer is carried out to a disk. By coating the 2nd radiation hardening mold liquefied ingredient after that, forming the 2nd layer, irradiating a radiation with a radiation irradiation means after that at a disk, and stiffening the 1st layer and 2nd layer completely Since the 1st layer is stiffened completely, the processing time can be shortened compared with the case where the 2nd layer is coated. Moreover, the following layer is coated with a semi-hardening condition, and generating of the crack by the interface formation between both layers is reduced by stiffening both layers completely after that.
[0083] Moreover, it sets to the manufacture approach of the optical disk which includes the process which carries out the laminating of the two-layer radiation hardening mold resin layer at least by the optical disk

manufacture approach of this invention. After carrying out the laminating of the one resin layer, a radiation with the operation which stiffens this resin layer is irradiated, after this resin layer's repeating the process of stopping an exposure in the state of semi-hardening, and carrying out the laminating of the following layer and carrying out the laminating of the last layer, a radiation is irradiated and full hardening of all the layers is carried out. Thus, the processing time can be shortened by carrying out the laminating of the following layer in the state of semi-hardening, without stiffening each class completely. Moreover, generating of the crack by the interface formation between layers is reduced.

[0084] Moreover, a location gap of two goods transfer hands can be compensated with the goods processing system as another mode of this invention by making the location of the goods on one processor movable approximately in an one direction, and the goods by the transfer hand can be taken up correctly.

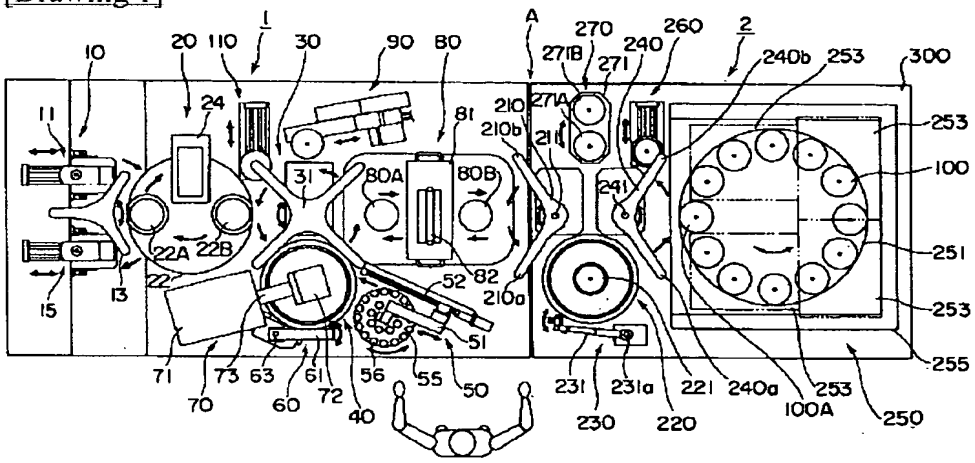
[Translation done.]

* NOTICES *

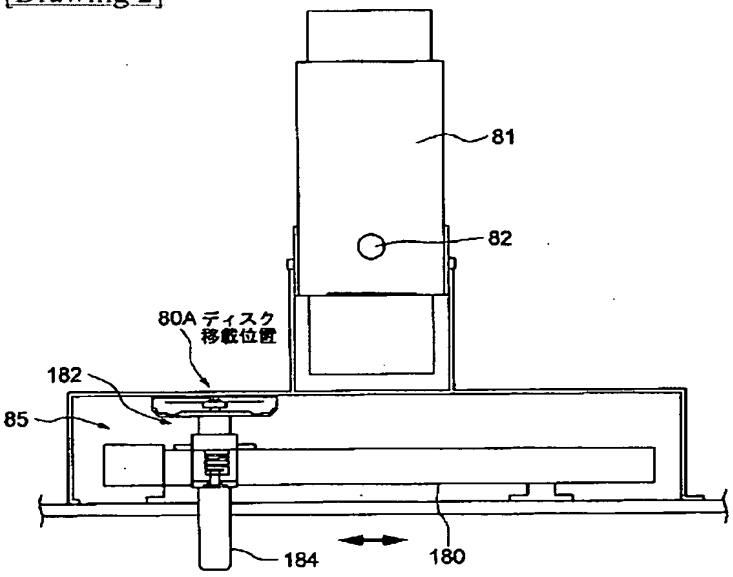
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

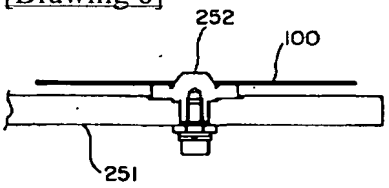
[Drawing 1]



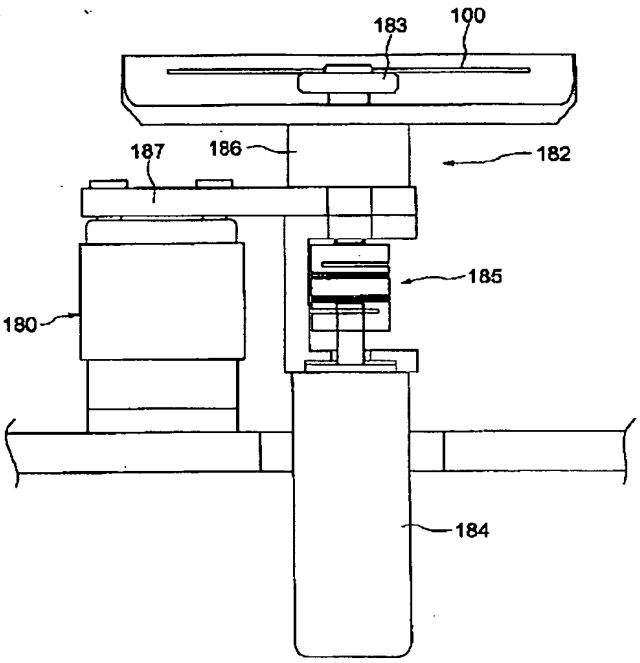
[Drawing 2]



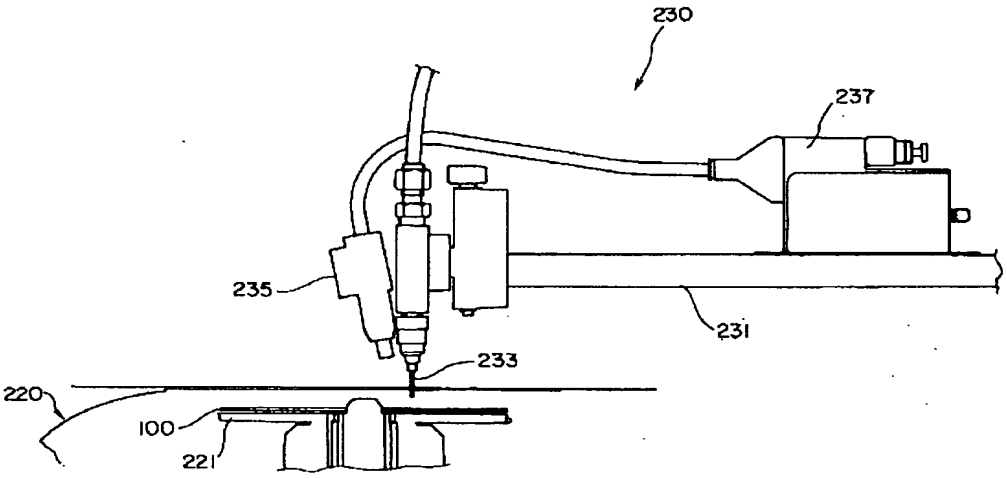
[Drawing 6]



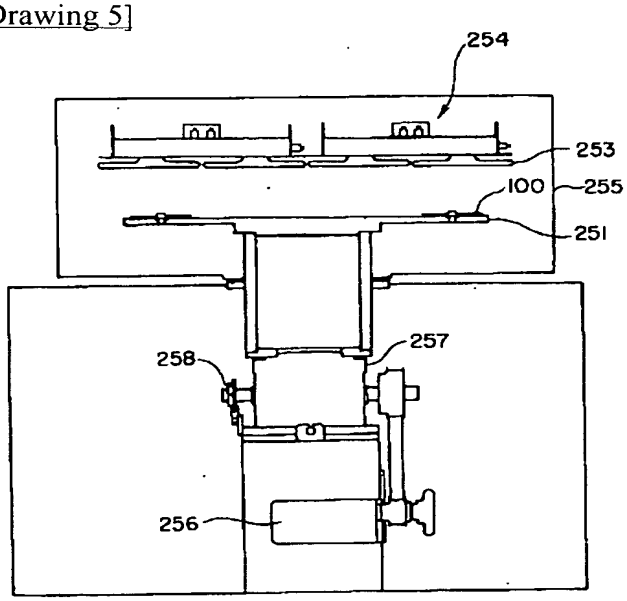
[Drawing 3]



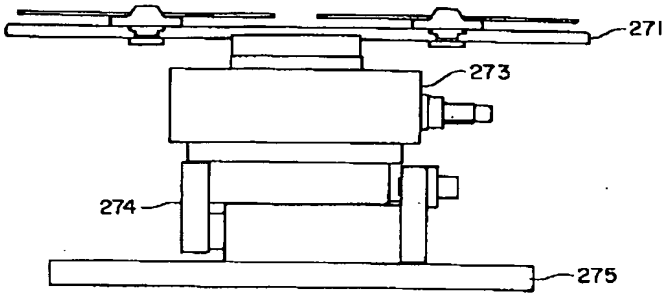
[Drawing 4]



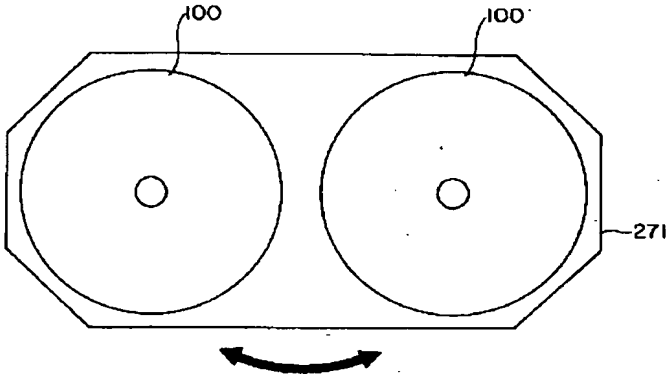
[Drawing 5]



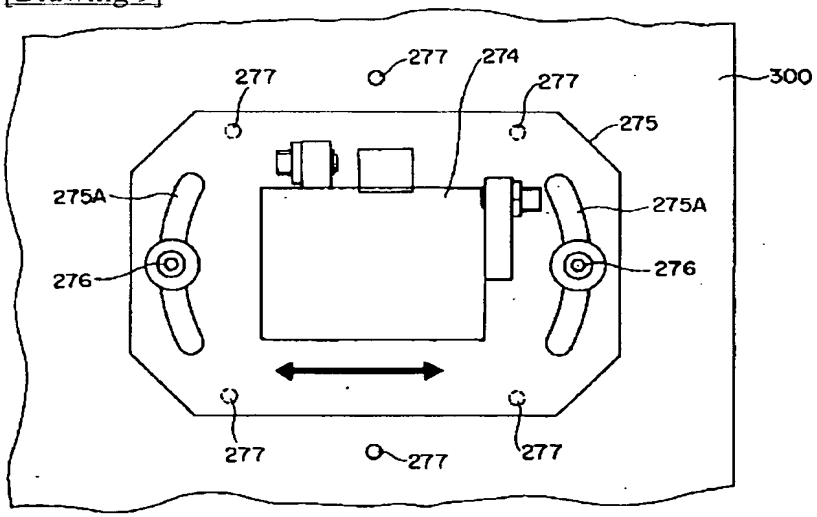
[Drawing 8]



[Drawing 7]



[Drawing 9]



[Translation done.]